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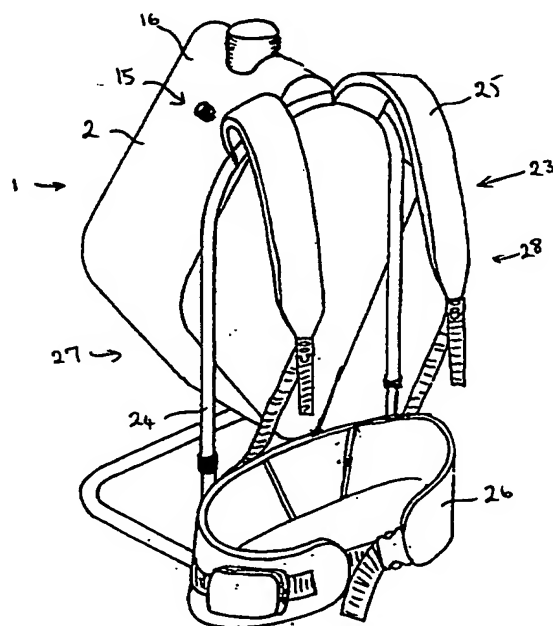
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(54) Spraying apparatus

(57) A spraying apparatus (1) comprising a harness comprising front and back portions for being worn in use on the front and back respectively of a user is disclosed. A container (2) is mounted on the back portion for receiving liquid and a quantity of gas in a head space defined above the liquid in use. Pressurising means for supplying compressed gas is connected to the container and operable to pressurise gas in the head space. An outlet duct is connected to the container for conducting liquid therefrom to a dispensing outlet of the outlet duct. The pressuring means is mounted on the front portion of the harness and is connected to the container by means of an inlet duct for conducting compressed gas into the head space.

Fig 2



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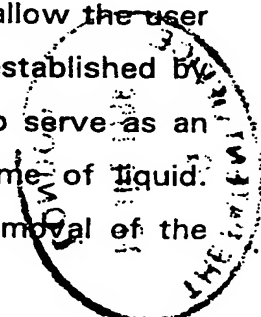
Spraying Apparatus

This invention relates to spraying apparatus in which liquid is pressurised in a container mounted on a harness carried on the back of a user and in particular but not exclusively to spraying apparatus for use in manually spraying insecticides and herbicides.

It is known to spray liquids using a container mounted on a harness or knapsack, liquid within the container being delivered via an outlet duct to a dispensing nozzle typically mounted on a hand held wand for directing spray in a localised manner.

It is also known for such containers to include a displacement pump operable to pump the liquid in response to manual actuation by means of a lever projecting forwardly of the cylinder, so as to be accessible to the user while wearing the harness, the pumped liquid being transferred by pumping actuation into an accumulator in which a trapped volume of air subsequently provides pressure to dispense liquid from the container. A disadvantage of such apparatus is that the pump is formed integrally with the container and is immersed in the liquid to be dispensed. Such apparatus is relatively expensive to manufacture and can be difficult to service.

It is also known alternatively to provide such apparatus in which air contained in a head space above the liquid within the container is pressurised by means of an air pump mounted on the container. Such apparatus requires that the harness be removed in order to allow the user to gain access to the pump, sufficient air pressure being established by pumping air into the head space to enable the container to serve as an accumulator during the subsequent dispensing of a volume of liquid. Such apparatus is inconvenient to use since it requires removal of the



harness before each pumping operation and the manufacture of the container to accommodate integrally such an air pump is relatively complex. Such apparatus has generally hitherto been adapted to deliver relatively small volumes of liquid (about 2 litres).

5

According to the present invention there is disclosed spraying apparatus comprising a harness comprising front and back portions for being worn in use on the front and back respectively of a user, a container mounted on the back portion for receiving liquid and a quantity of gas in a head space defined above the liquid in use, pressuring means for supplying compressed gas, the pressuring means being connected to the container and operable to pressurise gas in the head space, and an outlet duct connected to the container for conducting liquid therefrom to a dispensing outlet of the outlet duct, wherein the pressuring means is mounted on the front portion of the harness and is connected to the container by means of an inlet duct for conducting compressed gas into the head space.

An advantage of such spraying apparatus is that the pressuring means is readily accessible to the user since it is located on the front portion of the harness.

The pressuring means may comprise a pump for supplying compressed air. The pump may comprise a hand actuated piston and cylinder.

Alternatively the pressuring means may comprise a compressed gas cylinder. The compressed gas may for example be compressed air supplying compressed air to the head space above the liquid in use.

30

Preferably the compressed gas cylinder is releasably connected to the inlet duct.

5 The user may thereby readily replace spent gas cylinders with fully charged gas cylinders without removing the harness.

Conveniently in any of the above disclosed spraying apparatus the pressuring means may be connected to the container via a one way valve facilitating the flow of gas into the container.

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The inlet duct may be connected to the container by means of a connector which incorporates the one way valve.

15

The connector may be mounted on a closure member of the container, the container defining a mouth to facilitate filling the container with liquid and the closure member being releasably connected to the container so as to seal the mouth.

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The apparatus preferably includes a pressure relief valve mounted on the closure member and operable to exhaust excess gas pressure from the container.

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Conveniently the outlet duct is connected to a dip tube extending into the container and having an inlet opening located adjacent to a base of the container.

30

The dip tube preferably includes a filter.

The inlet duct preferably is constituted by a flexible tube and the outlet duct may comprise a flexible portion extending between the container and a rigid portion of the outlet duct which is hand held in use.

5 The rigid portion preferably comprises a dispensing valve actuatable by means of a trigger.

10 Preferred embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings of which:-

Figure 1 is a schematic partly sectioned elevation of a container of a spraying apparatus in accordance with the present invention;

15 Figure 2 is a schematic perspective view of the container of Figure 1 mounted on a harness;

20 Figure 3 is a schematic front view of an operator wearing the harness of Figure 2 and carrying the apparatus of preceding Figures;

Figure 4 is a schematic rear elevation of the user of Figure 3 and the spraying apparatus of preceding Figures;

25 Figure 5 is a schematic side elevation of the user of Figures 3 and 4 and the spraying apparatus of preceding Figures;

Figure 6 is an exploded partly sectioned view of a filler cap of the container of Figure 1;

Figure 7 is a schematic partly sectioned elevation of an outlet connector between an outlet duct and the container of preceding Figures; and

5 Figure 8 is a schematic front view of an alternative spraying apparatus having a compressed gas cylinder.

10 In Figure 1 a spraying apparatus 1 comprises a container 2 of blow moulded plastics material and having an externally screw threaded neck 3 defining a mouth 4. A closure member 5 in the form of a generally cylindrical moulding of plastics material is inserted into the mouth 4 and retained by an internally screw threaded collar 6 having an inwardly projecting annular first flange 7 which locks over a co-operating second flange 8 projecting radially from the closure member 5.

15

An annular seal 29 is interposed between the first and second flanges 7 and 8 to provide an air tight seal between the closure member 5 and the collar 6.

20 As shown more clearly in Figure 6, the closure member 5 incorporates an air supply connector 9 including a check valve (not shown) allowing one way entry of air through the closure member 5 into the container 2. The check valve is of the type commonly used in inflatable tyres (Schrader valve). An air duct 10 in the form of a flexible tube is releasably coupled to the air supply connector 9 by a screw coupling 11.

25

30 A pressure relief valve 12 is also mounted on the closure member 5 and is operable to automatically exhaust air from the container 2 in the event of over-pressurisation. As shown in Figure 1, the container 2 contains a volume of liquid 13 and a volume of air in a head space 14

As shown in Figure 5, the outlet duct 17 is in the form of a flexible tube 32 extending from the outlet connector 15 to a rigid tubular portion or wand 21 which is hand held and which includes a dispensing nozzle 22.

As shown in Figure 2, the container 2 is mounted on a harness 23 of the knapsack type, having a rigid frame 24, shoulder straps 25 and a waist belt 26 and incorporating a quick release fastener (not shown) to enable the harness to be rapidly fitted and removed. The frame 24 thereby constitutes a back portion 27 of the harness 23 and the straps 25 and belt 26 constitute a front portion 28 of the harness.

As shown in Figures 3 and 5, a manually operable pump 30 is mounted on the front portion 28 of the harness 23, the pump being a piston and cylinder displacement pump of the type commonly used to inflate cycle tyres. The pump 30 is connected to the air duct 10 and is thereby operable to deliver compressed air to the head space 14 via the air supply connector 9 and its associated check valve.

The wand 21 is provided with a trigger 31 for actuating a dispensing valve (not shown) such that a spray is delivered from the nozzle 22 when the trigger is depressed.

5 In use, before putting on the harness 23, a user places a quantity of liquid in the container 2 by unscrewing the collar 6, removing the closure member 5 and pouring liquid into the container via the mouth 4. The initial level of liquid 13 is as shown in Figure 1, leaving a head space 14 of air above the liquid surface. The closure member 5 is then
10 replaced and the collar tightened such that the seal 29 is compressed between flanges 7 and 8, thereby providing an airtight seal.

The air duct 10 is connected to the air supply connector 9 by means of the screw coupling 11. The outlet duct 17 is connected to the
15 outlet connector 15.

The user may then put on the harness 23 as shown in Figures 3 to 5 such that the container 2 mounted on the back portion 27 of the harness 23 is supported comfortably in use, the pump 30 being attached
20 to the front portion 28 of the harness 23 so as to be readily accessible to the user and the wand 21 connected to the outlet duct 17 being manually accessible.

The user actuates the pump 30 to supply compressed air to the
25 head space 14 via the air duct 10 and the air supply connector and valve 9, the pump 30 being readily accessible to the user while the harness 23 is being worn. Alternatively when first applying compressed air to the head space 14 after initial filling, the pump 30 may be actuated prior to putting on the harness 23.

30

The user is then able to dispense a spray of liquid from the nozzle 22 by actuating trigger 31 such that liquid compressed within the container by action of the compressed air within the head space 14 is expelled via the outlet duct 17 and exits as a spray from the nozzle 22.

5

As dispensing continues, the level of the liquid 13 will progressively fall so that the volume of the head spray 14 expands, thereby resulting in a reduction in operating pressure. It will therefore be necessary periodically for the user to actuate the pump 30 to supply further compressed air to the head space 14. Since the pump 30 is readily accessible at the front portion 28 of the harness 23, it is not necessary for the user to remove the harness in order to actuate the pump 30. Successive dispensing operations may then continue until the supply of liquid 13 is exhausted. The harness 23 is then removed and the supply of liquid replenished as described above.

10
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The outlet duct 17 may in an alternative embodiment be attached to the harness 23, for example by being stitched into the fabric of the straps 25 over part of its length. Similarly the air duct 10 may either be stitched into the fabric of the straps 25 or secured by additional straps or other suitable fasteners.

20

The outlet connector 15 may alternatively be incorporated into the closure member 5. This has the advantage that the container 2 is then a simple blow moulded article with a single opening, thereby simplifying its manufacture.

25

An alternative embodiment will now be described with reference to Figure 8 using corresponding reference numerals to those of preceding Figures where appropriate for corresponding elements.

30

The spraying apparatus 39 of Figure 8 pressurises air within the container 2 by means of a compressed air cylinder 40 which is releasably coupled by means of a coupling 41 to the air duct 10. The gas cylinder 40 is releasably secured to the front portion 28 of the harness 23 so as to be readily accessible to the user.

The compressed air cylinder 40 supplies sufficient compressed air to the container 2 to enable liquid 13 to be dispensed for an extended period. When it is required to replenish the cylinder 40, the cylinder is disconnected from the air duct 10 and a fresh cylinder coupled to the coupling 41 without removal of the harness 23 being necessary.

The cylinder 40 may alternatively be pressurised with other inert gases such as nitrogen.

The shape of the container 2 in the above embodiments may alternatively comprise a broad base enabling the container to be stood in an upright position when not supported on the harness 23.

Claims

1. Spraying apparatus comprising a harness comprising front and back portions for being worn in use on the front and back respectively of a user, a container mounted on the back portion for receiving liquid and a quantity of gas in a head space defined above the liquid in use, pressurising means for supplying compressed gas, the pressuring means being connected to the container and operable to pressurise gas in the head space, and an outlet duct connected to the container for conducting liquid therefrom to a dispensing outlet of the outlet duct, wherein the pressuring means is mounted on the front portion of the harness and is connected to the container by means of an inlet duct for conducting compressed gas into the head space.
2. Spraying apparatus as claimed in claim 1 wherein the pressuring means comprises a pump for supplying compressed air.
3. Spraying apparatus as claimed in claim 2 wherein the pump comprises a hand actuatable piston and cylinder.
4. Spraying apparatus as claimed in claim 1 wherein the pressuring means comprises a compressed gas cylinder.
5. Spraying apparatus as claimed in claim 4 wherein the compressed gas cylinder is releasably coupled to the inlet duct.
6. Spraying apparatus as claimed in any preceding claim wherein the pressuring means is connected to the container via a one way valve facilitating the flow of gas into the container.

7. Spraying apparatus as claimed in any preceding claim wherein the inlet duct is connected to the container by means of a connector and wherein the one way valve is incorporated in the connector.

5 8. Spraying apparatus as claimed in Claim 7 wherein the connector is mounted on a closure member of the container, the container defining a mouth to facilitate filling the container with liquid and the closure member being releasably connectable to the container so as to seal the mouth.

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9. Spraying apparatus as claimed in Claim 8 comprising a pressure relief valve mounted on the closure member and operable to exhaust excess gas pressure from the container.

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10. Dispensing apparatus as claimed in any preceding claim wherein the outlet duct is connected to a dip tube extending into the container and having an inlet opening located adjacent to a base of the container.

20

11. Spraying apparatus as claimed in Claim 10 wherein the dip tube comprises a filter.

12. Apparatus as claimed in any preceding claim wherein the inlet duct is constituted by a flexible tube.

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13. Spraying apparatus as claimed in any preceding claim wherein the outlet duct comprises a flexible portion extending between the container and a rigid portion of the outlet duct which is hand held in use.

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14. Spraying apparatus as claimed in claim 13 wherein the rigid portion comprises a dispensing valve actuatable by means of a trigger.

15. A method of spraying liquid from a container comprising the steps of
of
mounting the container on a back portion of a harness,
wearing the harness such that front and back portions of the harness are
5 worn on the front and back of a user,
connecting a pressurising means to the container and supplying
compressed gas from the pressurising means into a head space defined
above the liquid in the container,
connecting an outlet duct to the container,
10 conducting liquid from the container to a dispensing outlet of the outlet
duct, and spraying liquid from the outlet duct,
wherein the method includes the steps of mounting the pressurising
means on the front portion of the harness and connecting the
pressurising means to the container by means of an inlet duct for
15 conducting gas into the head space.

16. A method as claimed in claim 15 wherein the pressurising means
compresses a pump, the method including the step of manual actuation
of the pump by the user while wearing the harness to supply compressed
20 air to the head space.

17. A method as claimed in claim 15 wherein the pressurising means
comprises a compressed gas cylinder, the method including the step of
replacement of a spent gas cylinder with a charged cylinder by the user
25 while wearing the harness.

18. Spraying apparatus substantially as hereinbefore described with
reference to and as shown in any of the accompanying drawings.

30 19. A method of spraying liquid substantially as hereinbefore described
with reference to and as shown in any of the accompanying drawings.





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Claims searched: 1-19

Examiner: D. Haworth
Date of search: 10 October 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): F1R (R3A3B)

Int Cl (Ed.6): B05B 9/08; F04B 33/00; F04F 1/06

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2053366 A (DAS)	
A	GB 2019950 A (Caraid)	
A	GB 1449503 A (Malone)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Fig 1

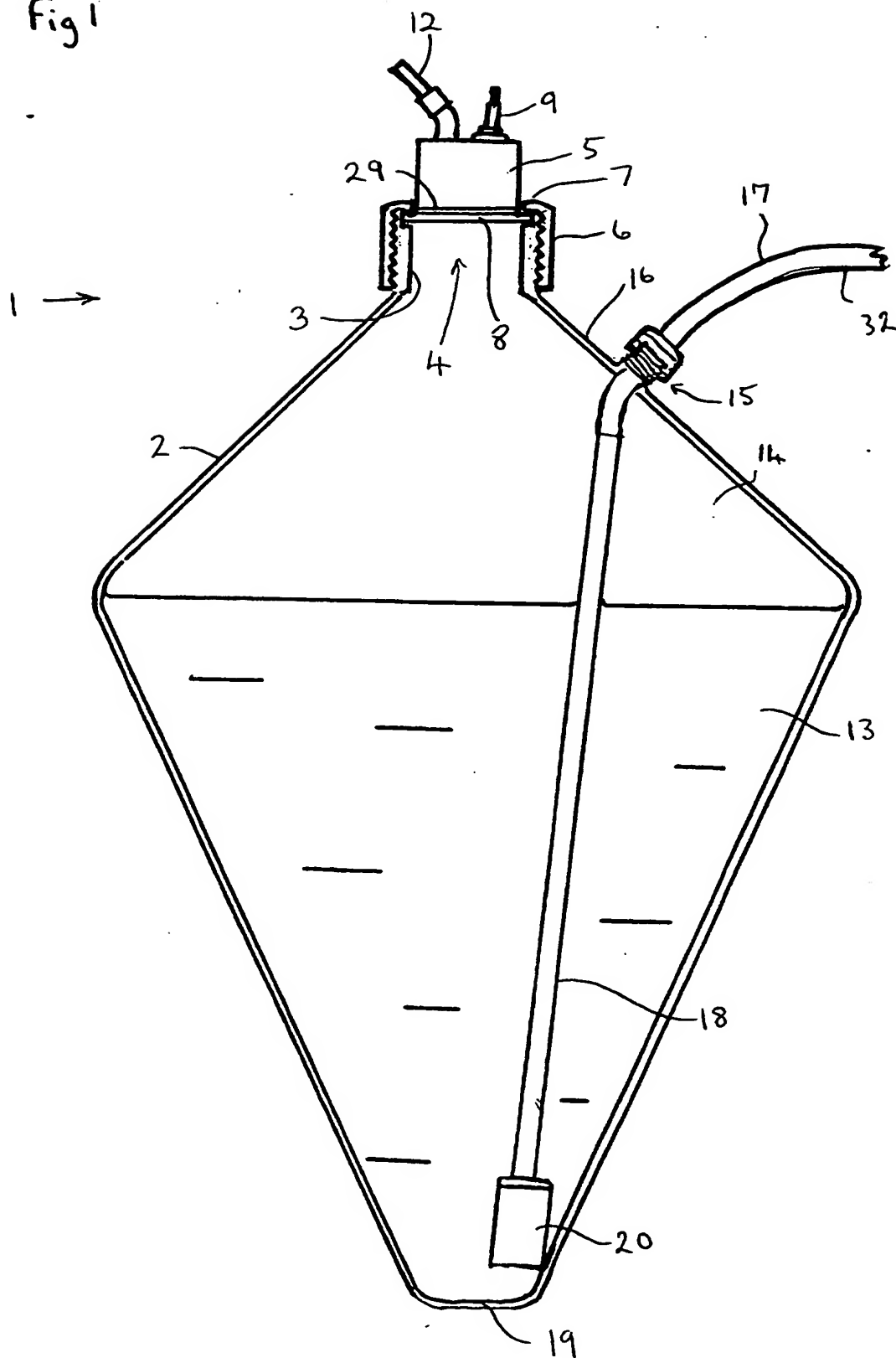


Fig 2

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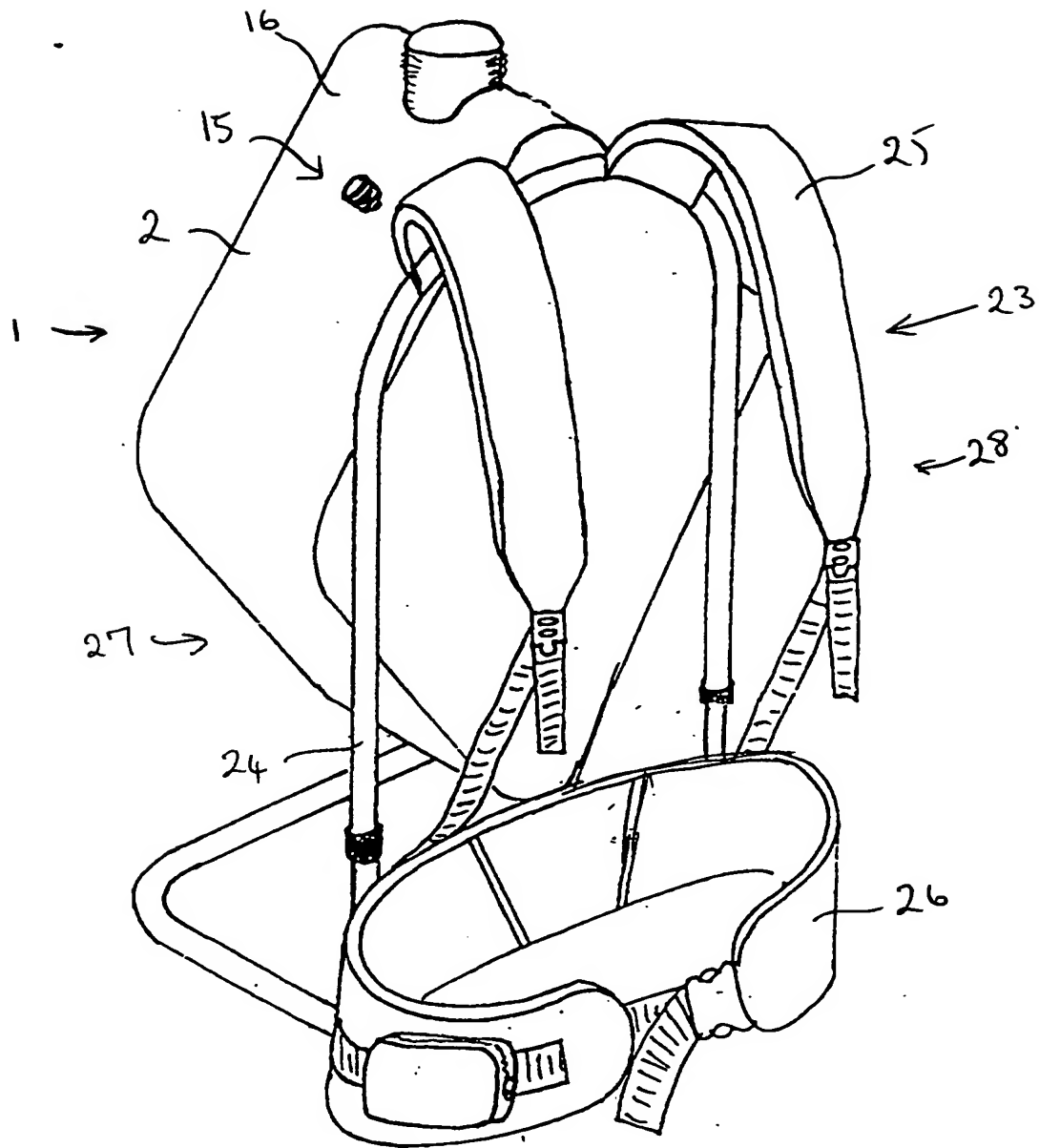


Fig3

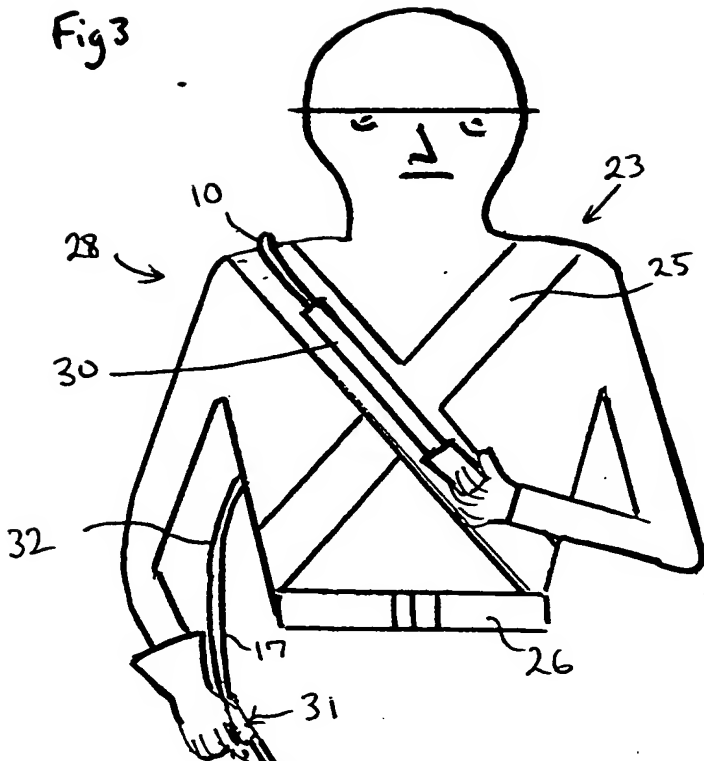


Fig4

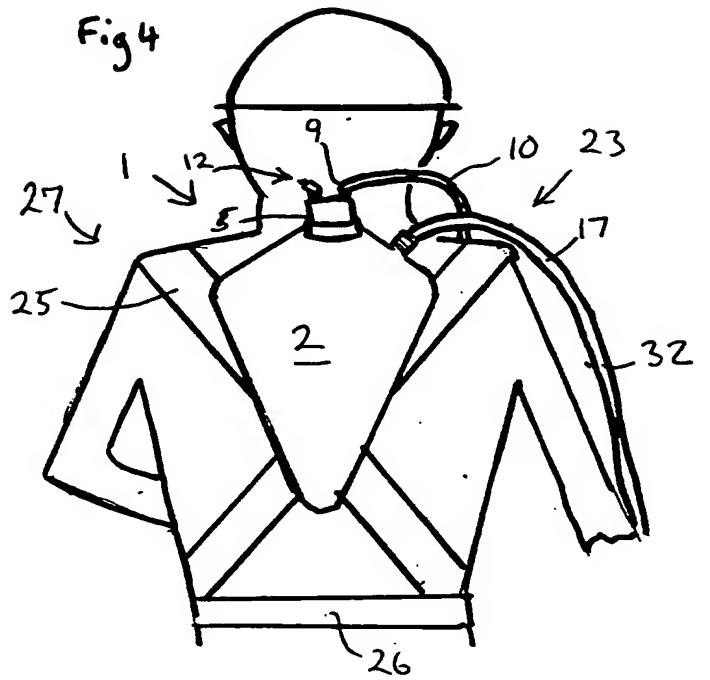


Fig5

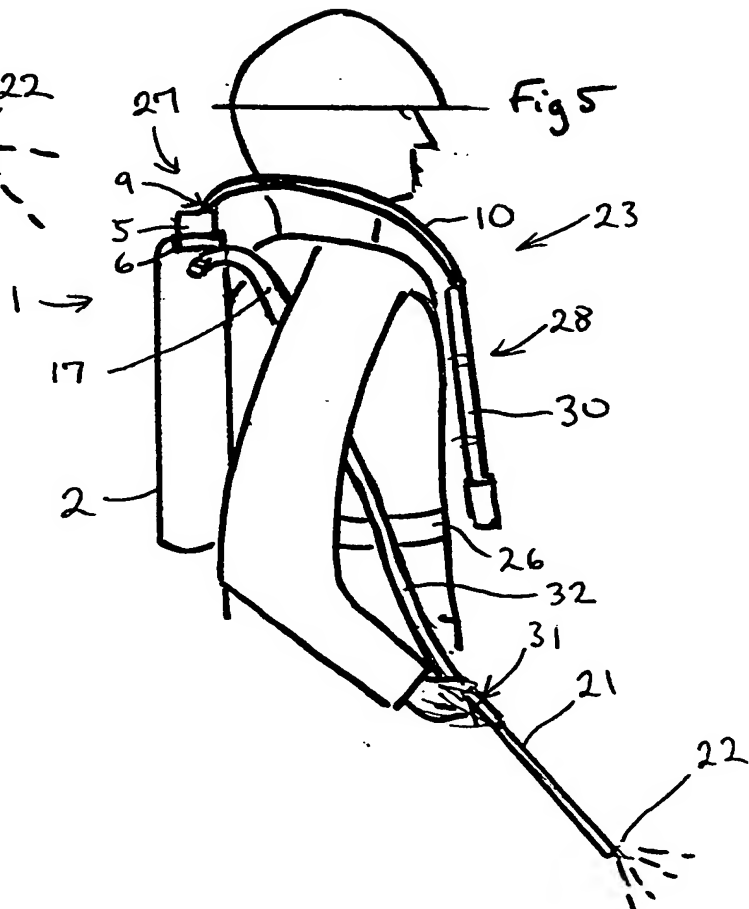


Fig 6

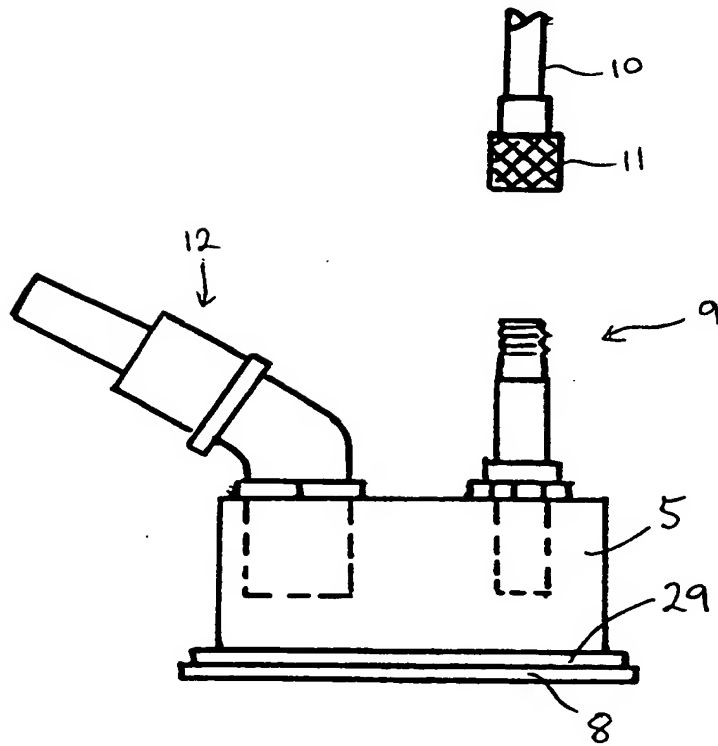
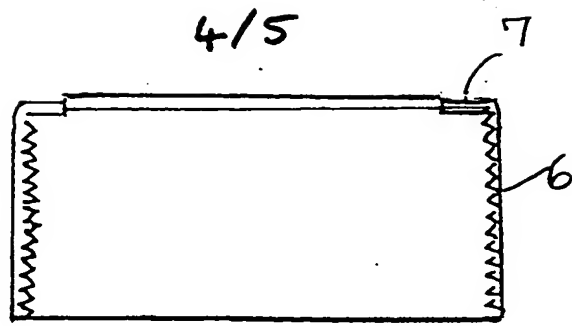


Fig 7

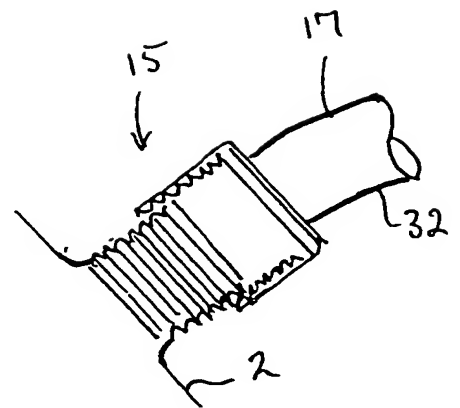


Fig 8